[0041] Using the following formula, inverse discrete fractional Fourier b=[b(0),b(1) , . . . b(N−1)] of B can be obtained:

$$b(n) = IDFrFT\{B(m)\} = \sqrt{\frac{\sin\alpha + j\cos\alpha}{N}}\, e^{-j\frac{1}{2}cot\alpha\square n^2\Delta t^2} \sum_{m=0}^{N-1} B(m) e^{j\frac{2\pi}{N}mn} e^{-j\frac{1}{2}cot\alpha\square m^2\Delta u^2} \quad n = 0, 1 \ldots , N-1 \tag{15}$$

[0042] The formula (11) and the formula (12) are brought into the formula (13):

$$b(n) = N\sqrt{\frac{\sin\alpha + j\cos\alpha}{N}}\, e^{-j\frac{1}{2}cot\alpha\square(iM)^2\Delta t^2} \sum_{i=0}^{L-1} r(i)\delta(n - iM) \quad n = 0, 1 \ldots N-1 \tag{16}$$

wherein r(i)=IDFT {R(m)}. From the formula (14) can be seen that sequence B with N-length. After inverse discrete fractional Fourier transform of B, the time domain $b^{(l)}$ sequence is obtained which is only related to $r^{(l)}$ (i), and the number of non-zero is only L.

[0043] B. The Method of Low Complexity PAPR Suppression

[0044] As the basic principles of SLM method, multiply alternative random phase sequence B whose number is S is multiplied by the data before subcarrier modulation, and then alternative signals $\overline{X}^{(l)}$ whose number is S can be obtained:

$$\overline{X}^{(l)}=X\square B^{(l)}[X(0)\square B^{(l)}(0),X(1)\square B^{(l)}(1), \ldots , X(N-1)\square B^{(l)}(N-1)],\ l=1,2, \ldots S \tag{17}$$

[0045] Then, make these alternatives IDFRFT, and obtain alternative signal $\overline{x}^{(l)}$ whose the number is S of time-domain FRFT-OFDM.

$$\overline{x}^{(l)}=IDFrFT\{\overline{X}^{(l)}\} \tag{18}$$

[0046] Fractional circular convolution theorem:

[0047] If

$$\tilde{X}^{(l)} = X\square B^{(l)} e^{j-\frac{1}{2}cot\alpha\square m^2\Delta u^2} \tag{19a}$$

Then

$$\tilde{x}^{(l)} = x \underset{p}{\overset{N}{\otimes}} b^{(l)} \tag{19b}$$

[0048] Which:

$$\underset{p}{\overset{N}{\otimes}}$$

is n-point circular convolution Fractional with p-order.x is N-point inverse discrete fractional Fourier transform of X; b(1) is an N-point inverse discrete fractional Fourier transform of $B^{(l)}$. Contrast formula (15) and formula (17.a), $\overline{X}^{(l)}$ need to be amended.

[0049] Make

$$\tilde{X}^{(l)}(m) = \overline{X}^{(l)}(m)\square e^{j-\frac{1}{2}cot\alpha\square m^2\Delta u^2}$$

(after receiving end making DFRFT, $\overline{X}^{(l)}$ can be obtained easily by multiplied a phase factor

$$e^{j\frac{1}{2}cot\alpha\square(m)^2\Delta u^2})$$

as the candidate signals of this method. And then N-point IDFRFT of □$X^{(l)}$ is:

$$\overline{X}^{(l)}\tilde{x}^{(l)} = IDFrFT\{\tilde{X}^{(l)}\} = x \underset{p}{\overset{N}{\otimes}} b^{(l)} \tag{20}$$

[0050] Due to expression of $b^{(l)}=\{b^{(l)}(0),b^{(l)}(1), \ldots , b^{(l)}(N-1)\}$

$$b^{(l)}(n) = N\sqrt{\frac{\sin\alpha + j\cos\alpha}{N}}\, e^{j-\frac{1}{2}cot\alpha\square(iM)^2\Delta t^2} \sum_{i=0}^{L-1} r(i)^{(l)}\delta(n - iM) \quad n = 0, 1 \ldots N-1,\ l = 1, 2, \ldots , S \tag{21}$$

wherein $r^{(l)}$ (i)=IDFT{$R^{(l)}$ (m)}. Bring formula (19) into the formula (18) can obtain:

$$\tilde{x}^{(l)}(n) = \sum_{i=0}^{L-1} r^{(l)}(i)\square x((n - iM))_{P,N}\square R_N(n)\square e^{j\frac{1}{2}cot\alpha\square[-2\square iM\square n+(iM)^2]\Delta t^2} \quad n = 0, 1 \ldots N-1,\ l = 1, 2, \ldots S \tag{22}$$

$$\text{wherein } R_N(n) = \begin{cases} 1 & 1 \le n \le N-1 \\ 0 & \text{other} \end{cases}$$

is the value of the primary value range; $x((n-iM))_{P,N}R_N(n)$ is a signal which is obtained by periodic extension of chirp with N-cycle and p-order, and then carry it on a circular movement. That is, according to the formula (21) shows the cycle of the chirp, $x((n))_{P,N}$ can be obtained by periodic extension of chirp.

[0051] That is, according to the formula (21) the chirp cycle is shown, the X is extended to the chirp cycle, then the P is shifted and the main value range is taken.

$$x(n - N)e^{j\frac{1}{2}cot\alpha\square(n-N)^2\Delta t^2} = x(n)e^{-j\frac{1}{2}cot\alpha\square n^2\Delta t^2} \tag{23}$$

[0052] Making

$$\eta(n, i) = e^{j\frac{1}{2}cot\alpha\square[-2\square iM\square n+(iM)^2]\Delta t^2},$$

then η(n,0)=1, formula (20) can expressed as formula (22).